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# Journal of the Society of Arts.

FRIDAY, APRIL 3, 1868.

## Announcements by the Council.

### ARTISANS' REPORTS ON THE PARIS EXHIBITION.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

### ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock:—

APRIL 8.—*Passion Week.* No MEETING.

APRIL 15.—"On Liquid Fuel." By BENJAMIN H. PAUL, Esq.

APRIL 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. GIBBS, Esq.

APRIL 29.—"On Progress in Oyster Culture." By HARRY LOBB, Esq.

### CANTOR LECTURES.

The last lecture of Dr. Grace Calvert's course, "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," will be delivered on TUESDAY, the 7th of April, as follows:—

#### LECTURE IV.—TUESDAY, APRIL 7.

THE CONVERSION OF CHLORIDE OF SODIUM INTO CARBONATE OF SODA.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash*, *soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

### ALBERT MEDAL.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage,

and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

### SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

## Proceedings of the Society.

### FOOD COMMITTEE.

The Committee met on Wednesday, March 18th. Present—B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, Mr. G. F. Wilson, F.R.S., Mr. Edward Wilson, Mr. J. Ludford White, Rev. J. E. Hall, and Mr. E. Holland.

Mr. JAMES REDMOND BARRY, Inspecting Commissioner of Irish Fisheries, attended to give information respecting the sea fisheries of Ireland.

THE CHAIRMAN.—We have had some evidence from Mr. Blake, as to the desirability of Government granting loans for the purpose of aiding the fisheries on the west coast of Ireland, and there seems no doubt that such a plan would very much benefit the fishermen of Galway, but the question remains how far it would develop the produce, and whether it would do so to such an extent as to make an imperial question of it, or as likely to considerably increase the supply of nourishment to the people.

Mr. BARRY.—It would develop the fisheries to a much greater extent than they are at present. I have been connected with the fisheries of Ireland a great many years, and am now the only inspector. My duties now do not extend to the inland, but only to the sea fisheries. I am not very fully acquainted with the provisions of the measure introduced by Mr. Blake, and I don't quite accord with all his views. His measure was introduced before the appointment of the Select Committee of which

he was chairman; and I was under the impression that his views had been materially altered by the evidence adduced before that Committee. I am clearly of opinion that the estuaries of Ireland contain a large quantity of fish, which, under better arrangements might be obtained for the use of the people.

The CHAIRMAN—Part of the measure which Mr. Blake proposes is, that the loan system should be restored; that loans out of a fund voted by Parliament should be granted, partly to assist in providing curing-houses, and partly to provide fishing-boats and gear of all kinds. Are you of opinion that such a measure would be likely to prove successful?

Mr. BARRY—It would aid, no doubt. The country has been reduced to a state of great pauperism by the unfortunate occurrence about twenty years ago, of what is known as the potato famine. The country has never recovered from that, and that branch of industry has been peculiarly affected. The peasantry upon the coast who used to devote themselves, some exclusively, to fishing, and some partially to fishing and partially to the cultivation of small farms, have in a great measure vanished. They have either died or emigrated, and, as far as my experience goes, the want in Ireland seems now to be rather of men than of appliances. Formerly the great want was of means and of appliances to employ the men. I have myself endeavoured to encourage the formation of one or two small companies—one, in particular, in the south of Ireland, and I have watched their proceedings with great interest. There is in this case no want of means, as the parties who have formed this company are merchants of a very high order, both of means and intellect, in the city of Cork. They have now been three years in operation, and have contrived to get on pretty well; but their greatest want, so far as I can learn, has been want of men. That is in consequence of the great amount of emigration. Even if there were abundance of money supplied I hardly know where, under present circumstances, occupation could be found for it. Still it is to be hoped that the evil would diminish if encouragement were offered to labour. Numerous cases come before the department with which I am connected—the Fishery Commission, where applications are made from persons in extreme distress. I speak of the whole coast of Ireland, which I occasionally visit, but particularly the south. It was in that quarter, where there are a number of small harbours on the coast, where the fisheries most flourished before the famine, and before the exodus; and we have frequent applications still for assistance to procure boats and nets; and if there was any fund from which such assistance could be supplied, it would no doubt greatly increase the number of takers, and the quantity taken will of course depend upon the number of persons employed. I refer to the coast generally; but the east coast is much better supplied in every way. It is a different kind of fishing there; there are more inlets and small harbours, and the fishing is conducted in a more commercial spirit. It is much resorted to by a number of intelligent and experienced fishers, who come from Cornwall, from the Isle of Man, and some from Scotland. The fleet at Howth, a short distance from Dublin, will sometimes number nearly 500 vessels. This state of things has considerably improved the skill and stimulated the industry of the native population in the neighbourhood; and those who used to devote themselves to fishing on that coast—I particularly allude to the herring fishery—have again taken to it. There are three ports, Arklow, Ardglass, and Waterford, or Dunmore, which now supply men for the fleet to a much greater extent than formerly, and they have become very skilful and industrious. The consequence is, that during the last three or four years the capture of herrings has become very considerable, and these places have become remarkable as depôts for them. Then, again, the establishment of railways has been of immense value, as there cannot now be a surplus quan-

tity taken. I can well remember the time when the fishermen used to be desirous of limiting the quantity taken, as a small quantity paid better than a large; but there is now no limit to the demand at a fair and reasonable price.

The CHAIRMAN—How is the cargo disposed of when it arrives? I am still speaking of the east coast.

Mr. BARRY—The sale is by public auction. The fleet goes out in the evening to fish, and returns by daylight in the morning. There is telegraphic communication with Liverpool. I am now speaking of Howth, which is one of the most important places, and the prices vary, of course, according to the supplies that come in, and according to the demand in Liverpool. There are steamers and vessels ready, which are employed in carrying the fish, which is very slightly salted, so as to keep during the voyage, and taken to Liverpool. Some, of course, goes to Dublin, and a great quantity goes into the interior of the country.

The CHAIRMAN—Is there any chance, in your opinion, of imparting that commercial character to the fisheries on the west coast, so as to ensure there being no surplus of take there?

Mr. BARRY—The first step would be to afford facility of transit. The want of railways and of other means is a great and serious difficulty on the west coast. No system of loans would get over that difficulty. If vessels were supplied, and if money were given, there would still be a great want so long as there was a lack of means of transit. For instance, some of the best fishing banks on the western coast are at Buffin Island and off the coast of Galway and Mayo, fifty miles from any railway, so that if fish were brought in, there would be no means of conveying it to a market. Curing-houses might be established, but curing has not been found a profitable pursuit.

The CHAIRMAN—I understand you to say that on the east coast a considerable number of English and Scotch fishermen are engaged. Can you tell us about what is the proportion of Irish?

Mr. BARRY—About one-third are Irish. The vessels that come from England and Scotland are fully manned and fully equipped; and I must say that the example set by these boats, particularly those from Cornwall, has been of infinite service to our country.

The CHAIRMAN—What would be your impression as to the railways in connexion with the west coast; that you should first create the railways or first raise the fisheries, so as to encourage the railways to be made?

Mr. BARRY—I have very little doubt but that each would stimulate the other, but I should like to see the railways made before I became a member of a fishing company on the west coast. There is no difficulty in this respect on the east coast, and the fishing there is, I think, established so securely that a system of loans is not required.

The CHAIRMAN—Then, in fact, your opinion is, that on the east coast such a system is not necessary, and that on the west coast it would be premature?

Mr. BARRY—Exactly.

The CHAIRMAN—And that at present any mere stimulus to the fisheries, by means of loans, would tend to create local industry, but not a national source of supply?

Mr. BARRY—Exactly so.

The CHAIRMAN—We understand that there is not one uniform law governing the fisheries of the three kingdoms. Are you of opinion that the regulations should be made uniform?

Mr. BARRY—So far as the deep-sea fishing is concerned I do not know of any difference; but there are certain fishings in which the fashion of the day seems to be to alter the old system, and in that respect I think we have managed better in Ireland. For instance, in many places, the oyster fishery has been almost completely extinguished, from being overworked, and from want of provident arrangements. I am one of those

who are old-fashioned enough to think that a period of reproduction is quite necessary to that fish—and *that* we have strictly observed in Ireland. We cannot do it with other fish, because the periods of fructification differ. As regards oysters we have closely observed it for many years, and the consequence is that our oyster beds are fairly stocked, and we have supplied large quantities not only to England but also to France. I am sorry to say that there is a course of legislation now in progress which will, I predict, have a very prejudicial effect on our oyster fisheries, on one part of the coast especially, and we shall soon cease to be suppliers, simply because we shall have none to supply. I am alluding to the convention with France. It is now the fashion, since the establishment of the Royal Commission, and since the report of that commission has been promulgated, to believe that no close time for oysters is required; and, acting on that principle, it is to be extended to the coast of Ireland. Our best oyster fishings are upon the east coast, in the Irish Channel, and every season numbers of vessels go from Arklow—one of the most important parts—to take the oysters from those beds. The close time has been strictly observed, and the consequence has been that we have not yet observed any extraordinary diminution in the supply, as has been the case with the natural beds of England. The close season has been observed very strictly under the statute law of the 25th George III. The statute provides that oysters shall not be taken in any month in which there is not an “r” in the name—viz., from May to August inclusive.

The CHAIRMAN—Allow me to read to you an extract from the report of the English Commissioners:—“Every spawning oyster may be calculated to produce about 800,000 young. Reduce that estimate to one-eightieth of what it is, and it is obvious that no oyster bed is in the smallest danger of exhaustion from overworking alone if only 1 per cent. of the breeding oysters are left. For suppose that of every 500 oysters only 100 breed during the season, and the spat of only one of them is shed, that one will, by the supposition, yield 10,000 young oysters, or twenty times as many as the original stock. If the conditions for the development of the spat are favourable, it is produced on so enormous a scale that any check exerted by human influence is altogether insignificant; while, on the other hand, if these conditions are unfavourable, man is, in nine cases out of ten, powerless to affect them.” Of course you do not agree with that, but would you kindly tell the Committee how you meet that reasoning?

Mr. BARRY—I am utterly incapable of entering into these minute calculations, and I think they are all nonsense. I only know the positive fact, that when beds have been dredged without observing close time, which has sometimes happened, they have become barren. A work has recently been published on the subject of fisheries, entitled “The Harvest of the Sea,” by Mr. Bertram, which I have read with very great pleasure. I have made a short extract on the subject of close time, which I should like to read to the Committee.

Mr. CHESTER—This statement in the Commissioners’ report is at best but a theoretical calculation; and against that we have the undoubted fact that oysters have become exceedingly scarce, and that many beds have ceased to produce them.

Mr. BARRY—The extract is as follows:—“Without wishing to dogmatise on any point of ‘oyster life,’ I think I can bring before my readers in a brief way a few interesting facts in the natural history of the edible oyster. As is well known, there is a period every year during which the oyster is not fished; and the reason why our English oyster beds have not been ruined or exhausted by over-fishing, arises, among other causes, from this fact of there being a definite close time assigned to the breeding of the mollusc. It would be well if the larger varieties of sea produce were equally protected, for it is sickening to observe the countless numbers of unseasonable fish that are from time to time brought to

Billingsgate and other markets and greedily purchased. The fact that oysters are supplied only during certain months of the year, and that the public have a general corresponding notion that they are totally unfit for wholesome eating during May, June, July, and August (those four wretched months that have not the letter ‘r’ in their names), has been greatly in their favour. Had there been no period of rest it is almost quite certain that oysters would long ago—I allude to the days when there was no system of cultivation—have become extinct, so great is the demand for this dainty mollusc. Oysters begin to sicken about the end of April, so that it is well that their grand rest commences in May. The shedding of the spawn continues during the whole of the hot months, not but that during that period there may be found supplies of healthy oysters, but as a general rule it is better that there should be a total cessation of the trade during the summer season, because were the beds disturbed by a search for the healthy oysters the spawn would be scattered and destroyed.” So far as my humble opinion goes, I quite adopt those views. I think the Irish fisheries would receive a useful stimulus if there were in Dublin an exhibition of fishing appliances, &c., such as have been held in France, Holland, and other places, and it would direct public attention to the matter. We sent persons from our department to the exhibition at Boulogne and Paris, who brought back very valuable information.

Mr. CHESTER—We were told by Mr. Blake that since the time of the potatoe famine there had been a great reluctance on the part of the population in Ireland to eat fish without potatoes?

Mr. BARRY—Unhappily, that unwillingness did prevail during the period of the famine, and an enormous quantity of fish was either wasted or used for manure, but I do not think that state of things continues. I think since the people have been accustomed to the use of other food, they have become aware of the value of fish to eat with it, and have used fish whenever they could get it. I can hardly say that curing houses are established in Ireland, except at Dublin, where there is one belonging to the Irish Fishing Company. They cure herrings there; there is no brand used there. It has been pressed upon us very strongly, that either there should be no brand in Scotland, or that there should be one in Ireland also. It has been much urged by the company that there should be a brand everywhere or nowhere. I have been in Scotland, and have made a good deal of inquiry, and I am satisfied the system works well there; and, therefore, I should much rather see it extended to Ireland than abolished in Scotland.

The CHAIRMAN—We have had some little difference of opinion as to the extent to which the Irish fishermen would be likely to interfere with those of other countries coming to fish. On the one side, it has been said that they are very violent and ready to interfere with all foreign fishermen, and on the other hand, it is replied that the object was merely to prevent what they considered an injurious system of fishing, that of trawling.

Mr. BARRY—I am perfectly convinced that there has been no anti-national feeling. There can be no greater slander than to charge Irish fishermen with a disposition to interrupt strangers who come to fish on their coasts. I make that statement as to the whole extent of coast on the highest authority. We have annual reports from the inspecting commanders of coast guards, and those reports invariably contain the assurance that there is perfect tranquillity and quiet. On the other hand, there certainly have been, especially in one locality, strong prejudices against that mode of fishing, and there have been some little riotous proceedings in Galway, but they were very trifling and are greatly subsiding. In fact, it was one particular community which entertained those prejudices most strongly, and that community has so much diminished that scarcely a shadow of them remains. I am certain that if fishing by means of trawls were set up on a large scale by commercial companies, the people

would not only tolerate, but encourage it. I do not know as to the remains of these poor people, who were of a very primitive type, but I know that some trawlers have been established by persons of means, and some of these people at Clodda have worked for them, and have taken shares in the boats. I am sure they would not object to fish under the companies.

The CHAIRMAN—What do you say as to the stormy character of the sea on the west coast? We have had some evidence that it would prevent fishing ever being carried on there on a large scale. Mr. Blake informed us that fishing could only be carried on there occasionally when the weather permitted, and that no man could subsist by it alone, but would require a little bit of land which he could cultivate when he was unable to fish.

Mr. BARRY—That is quite right to a certain extent. It is a very stormy coast, and it is not supplied with all the facilities for shelter that would be desirable.

The CHAIRMAN—Would not that prevent the formation of companies; because they would be unable to make anything like a reasonable contract with a railway company to carry the fish, the take being so irregular?

Mr. BARRY—No doubt the seasons generally are very boisterous, and that is one of the unfavourable features which cannot be concealed. But upon that west coast there are some very favourable spots for fishing.

The CHAIRMAN—Do you know whether the weather is worse there than at the Hebrides?

Mr. BARRY—I do not know the Hebrides, but I should think the Irish coast is not so bad as I understand the Hebrides to be. There are a good many small islets off the west coast which afford some shelter. Clew Bay is a very fine harbour, and there is also shelter under Clare Island. That is a place particularly favourable, inasmuch as railway communication has now been opened between Westport and, I may say, the whole world. That is on the west coast, in the county of Mayo, and it communicates with the Great Western of Ireland. If I were asked what was the most important point as a nucleus for the formation of any fishing company on a large scale, I should say Clew Bay, as it possesses such facilities for transporting the fish. I could not give anything like an average as to the number of days a-week on which it would be possible to fish. There are a great many fine days in the summer sometimes, which is the principal time for fishing on the west coast. The bad weather is mostly in the winter. The winter fishing is also important, but about sixty years ago that was carried on to a considerable extent off Buffin Island, principally for ling.

Mr. CHESTER—Supposing Mr. Blake's idea were carried out, and there were a parliamentary fund established, to be granted in loans, subject to inspection, and suppose the board charged with the administration were to say they would not make any grants to individuals directly, but there must be local co-operation, and the formation of companies, which should raise a certain portion of capital first, which should be used in loans, do you think it would be possible to obtain such local co-operation?

Mr. BARRY—I am sorry to say that there is a great deal of sluggishness upon this subject. It is an exceedingly precarious pursuit, and I believe that those who have entered into the companies which have been formed have done so more from feelings of patriotism and benevolence than from an expectation that there would be any great gain. I know that to be the fact in one case, and I believe it to be the same in the other. I refer to companies in Cork and Dublin, the promoters of the latter being principally members of the Society of Friends, who did so from a spirit of benevolence. For some time they lost largely, and are only now beginning to retrieve their position.

The CHAIRMAN—If there were a larger and more seaworthy class of boats provided, would it be possible for them to keep the sea more regularly?

Mr. BARRY—They have a very fine class of boats; they

are built in Dublin, and the tonnage may be from 50 to 70 tons. This is on the east coast. There is a very small and bad class of boats on the west coast; if they were assimilated more to those on the east coast no doubt they could fish more regularly, and be able to stand out more. They are all open boats, and very badly provided. I am now concerned only with the sea fisheries. I was at first connected with the inland fisheries also, but I differed altogether from the new system of legislation adopted, and it was judged expedient to relieve me and the board with which I am connected from all interference with it. I do not hesitate to say that an increased quantity of food has not followed from what I must designate the class legislation in reference to that department of the fisheries.

#### CANTOR LECTURES.

The third lecture of Dr. Grace Calvert's course, "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," was delivered on Friday evening, the 27th of March.

#### SEVENTEENTH ORDINARY MEETING.

Wednesday, April 1st, 1868; THOMAS WEBSTER, Esq., Q.C., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Barry, J. J. Redmond, Ireland.  
Cleghorn, J. The Mount, York.  
Fraser, Alexander Colvin, Colchester.  
Mitchell, Albert, Elmstead, near Chislehurst.

The following candidates were balloted for, and duly elected members of the Society:—

Bradford, Rev. William, 120, Cambridge-road, N.E.  
Weston, Thomas, 115, Lower Thames-street, E.C.

The Paper read was—

#### HOW TO MAKE RAILWAYS REMUNERATIVE TO THE SHAREHOLDERS, BENEFICIAL TO THE PUBLIC AND PROFITABLE TO THE STATE.

By RAPHAEL BRANDON, Esq., ARCHITECT.

In the year 1854, it first occurred to me that the facilities offered to the public for travelling were very inadequate to the powers that the railways were capable of affording, and year by year since then I have made calculations in order to see if an universal system of cheap fares could not be established with advantage to the public and the road makers. The great question was to ascertain the minimum fares that could be made to pay; and although lower fares than those proposed in this paper might possibly prove more remunerative, yet the calculations are sufficient, I think, to show the feasibility of the scheme, and I have been fortified in my conclusions by the fact that each year's return has given more favourable results than its predecessor.

On the 21st of May, 1864, I forwarded to the Right Hon. W. E. Gladstone, M.P., then Chancellor of the Exchequer, a brief statement of the scheme which is sketched in the following paper. Since that time the attention of the Government has been imperatively called to the condition of the railways of the kingdom, and in March, 1865, a Royal Commission issued, the object of which it explains as follows:—

"To inquire into the charges now and heretofore made by the several railway companies of Great Britain and Ireland, for the conveyance on their lines of passengers, parcels, goods, minerals, animals, agricultural products, and other merchandise, and into the equality or difference

of such charges under similar circumstances, whether as between different companies, or by the same company in different cases; and where such inequality or difference exists, you are to inquire whether there are special circumstances which render necessary such inequality or difference; and you are also to inquire into the actual costs of such conveyance, and to compare such costs and charges respectively, if and so far as you shall think fit, with the costs and charges relatively to the accommodation given and service performed on the railways in any one or more foreign countries; and to report your opinion whether, with due regard to the progressive extension of the railway system, it would be practicable, by means of any changes in the laws relating to railways, or otherwise, to effect a more convenient interchange of traffic between the several systems of railways, and more economical arrangements for the working of railways, so as to make any considerable reduction in the said costs of conveyance, and in the charges to the public on account thereof; and more effectually to provide for securing the safe, expeditious, punctual, and cheap transit of passengers and merchandise upon the said railways with as near an approach as may be to uniformity of charge and equality of treatment for all persons under similar circumstances."

The object of the following paper is to point out the steps needed to make the railways what they should be, as the great arteries of circulation for the commerce and industry of the country. The system, under its present variously conducted and divided plans of management and mismanagement, has attained to a degree of development which renders its maintenance a national necessity; and recent events show that it is now in danger of collapsing, at least in parts. The scheme which I am about to lay before you is designed to show how it may be effectually maintained with largely increased convenience to the public and profit to the nation.

The formation and maintenance of practicable roads to facilitate internal communication is one of the principal requirements of commercial enterprise in any country, and all governments have devoted great attention to this important subject. The first great roads in England were made by the Romans, and carefully maintained during their occupation in perfect order throughout the land, according to their universal plan in a newly-acquired territory. Their primary object was, of course, to have ready means of communication for military operations between their camps and stations; but in a civilised and settled country, where commerce and industry are every day developing themselves, the necessity of good means of intercourse between the various centres of manufacture and the ports is equally important, and cannot be over-estimated.

The great highways of a country, being for the general use of the nation, should neither be left to the caprice of the different localities which they traverse, nor to the tender mercies of the private companies who may have formed different parts of them as commercial speculations. The king's highways, as our old roads used to be called, were under national authority, and powers existed to compel those localities where they were not well maintained to repair them effectually. The General Post-office has frequently repaired a road used by the Royal mails, and afterwards recovered the expense incurred thereon from the locality by a compulsory presentment.

Within less than half a century our system of inter-communication has undergone a complete change, and the great iron roads have taken the place of the king's highways. It is not too much to say that thousands travel where ten or twenty, at the utmost, travelled in the old coaching days; this is, of course, a great gain; but what I propose to consider in this paper is, whether the convenience of the public is provided for to anything like the extent that existing circumstances would permit, and also whether the interests of the shareholders would not be greatly benefited by making the convenience of the public their first consideration.

In order to arrive at these conclusions, it will be necessary to consider (1st) how these iron roads have been formed; (2nd), the powers granted to the various companies that have made them; (3rd), the reasons for those powers being granted; (4th), the present state of the roads, and the return made for the enormous sums which have been expended on the lines already completed; (5th), the benefit to the public; and (6th), the powers reserved by the Government.

I shall then be enabled to show, (1st), how the public convenience may be enormously increased; (2nd), the position of the shareholders improved; and (3rd), a large additional yearly profit produced which might be employed for the further development of the railway system, and in the reduction of taxation.

In making the following calculations, the returns provided in compliance with an order of the House of Lords have been taken as the basis, and it is therefore to be understood that the responsibility for the correctness of the figures rests upon the different railway companies.

1. According to the present system, the various railways are the private property of different companies, who made them as commercial speculations, and over whom the Government and the public exercise but very limited powers. These companies are naturally but little disposed to offer such facilities as may be much required by the public, but which do not promise a speedy return in the shape of profits (though this is a very short-sighted policy, for the greater inducements that are offered to travellers, the greater undoubtedly will ultimately be the return); and hence, while certain localities are most conveniently situated as regards railway communication, others are totally neglected, greatly to their detriment and to the injury of the railway companies themselves, who thereby lose many travellers.

Had the system been laid out on a comprehensive national plan, we might have had, ere now, a scheme in operation extending railway communication into every part of the land, without having expended as much money as has been already invested in the existing lines, much of which has been wasted upon establishing and maintaining rival lines, from which the public have reaped but doubtful and short-lived benefit, and which the shareholders have had bitter cause to repent. Railways should be carried into every part of the country, causing the population to spread over the land and thereby establishing new centres of commerce and industry.

It was quite natural that the principal towns should first have been considered in making railway communication, and, in connecting these one with the other, new and important towns have sprung up. But after the communications had been made between the large towns, it was a mistake to make rival or competing lines between the same places, and had the whole of the railways been under one management, on a comprehensive system, this would never have been dreamt of. The sums of money expended on these rival lines should have been employed in opening up the country, and this would have increased the value of land in all directions. Such a course would have proved more remunerative than investing money in a scramble to obtain a share of traffic which might have been accommodated by means of a judicious expenditure upon existing lines.

2. The special powers granted to railway companies were, first, the right to become corporate bodies; secondly, the power to purchase such lands as were needed for the purposes of making, maintaining and working their lines; and, thirdly, to charge tolls, not above certain amounts, for the use of these lines. From these tolls they were to obtain the return for the capital expended, and they had full powers to work the lines by placing thereon engines and carriages, or, if they so pleased, to lease the lines to others to work for them.

3. Let us now see upon what plea these powers were granted to private companies who came forward, in the first instance, simply as road-makers. It is the duty of

Government to see that the plant of the general industry and commerce of the country is fitly arranged and efficiently maintained, and the sense of this duty led, on the commencement of railways, to an examination of each scheme by a parliamentary committee before powers were granted to the company to make the line. This examination, however, was too often a mere form, but the public utility was always the principal item reported proved in the preamble of a railway bill, and as the projectors of a line were unable to obtain the land on which it was to be laid without the compulsory powers granted by Parliament, their prime object was to prove that the line was of great convenience, if not of absolute necessity, to the public. Parliament, moreover, at first, evinced anxiety to secure to the public every conceivable advantage; for instance, private individuals were to have the power to run their own engines and carriages at moderate tolls; maximum rates for all tolls were fixed, and especial attention was paid to the convenience of the public in the question of the mails. Further, the Government, applying to the railway system a principle of the patent laws, secured to itself the power of purchasing the railways after a certain term of years. The securing of this right is a recognition of the duty of the Government to maintain the efficiency of the great highways. This duty was even more directly exhibited about thirty years ago, with respect to Ireland, for the Government then issued a commission to survey and examine into the wants of that part of the kingdom, with a view to the establishment of a complete system of railway communication. The commissioners brought in a report recommending the formation of a number of trunk lines, but eventually the whole field was left to private speculation, and now the state of these various enterprises is such that it has become a matter of most pressing necessity that the Government should step in, purely in the interests of the public, and take the charge of the Irish railways, so as to secure the maintenance of proper communication.

4. Up to the year 1865 the returns made for railway investments had not been at all such as might have been expected from capital so laid out; and since the end of that year the profits have become less with a large number of railways; and the low prices at which all railway shares are now quoted, show that investments in such undertakings are not regarded with favour; in fact a glance at the share lists will justify the conclusion that the railways of the kingdom might all be purchased at a very large discount off their total aggregate outlay.

On referring to the returns of the railways up to the end of 1865, I find that the total amount expended on these undertakings throughout the United Kingdom was £443,572,250, exclusive of the capital returns for the lines not then open. Of this amount:—

£3,333,145	0.75 +	per cent. paid from 10 to 11 per cent.
8,563,394	1.9 +	" " 7½ " 10 "
179,445,242	40.5 —	" " 5 " 7½ "
220,014,037	49.6 +	" " below 5 "

411,355,818  
32,216,432 7.25 + " paid nothing.

443,572,250 100

Thus it results that of every £100 invested in railway schemes 15s. pays 10 per cent., £1 18s. returns under that amount and above 7½ per cent., £40 10s. pays from 5 to 7 per cent., while £49 12s. gives a return of less than 5 per cent., and £7 5s. is wholly unproductive. It is almost needless to observe that none but the first-named proportion give a return at all commensurate with what should be looked for from money adventured in such enterprises, not to allude to the fact that even the highest amount of dividend quoted falls below the

expectations held out to those who invested their capital at the commencement.

5. It is obvious that this enormous outlay has not proved beneficial to the shareholders, who found the money for the formation of the lines; let us now see if the public in general have gained such advantages as may be considered sufficient to convert the loss that has been sustained into a national gain. There is no doubt that we can travel with a speed and a security, and we may even add with a cheapness formerly unknown; but it is equally clear that what has been accomplished falls far short of what might be done were the system of railway travelling carried out in harmony; as witness how in numbers of cases the companies who cannot agree to work together for the public good, make innocent passengers the victims of their quarrels by refusing to run trains so as to carry them on when they reach a joint station, and so compel them to spend a few hours in the contemplation of chilly fires and stale pastry at such junction. Witness also the studied inconveniences placed in the way of third-class passengers, by running the trains at such times as to compel them either to continue their journey in a higher class, or to spend a night in a strange town; and witness the marvellous discomfort of some of the second-class carriages, cunningly devised to drive travellers into the first-class, but quite as frequently resulting in sending them into the third.

These are only a few of the evils the public have to bear in consequence of the mistaken notion of divided interests in the proprietorships of the railways, and the false idea that the interests of the shareholders and of the public are antagonistic. The object of this paper, however, is not so much to expose and dispel these errors as to show that the public have not yet obtained the full benefits to be derived from railway travelling, as well as that the shareholders might reap advantages in proportion to those conferred on the public, by the adoption of a better system.

6. These desiderata, it appears to me, can only be accomplished by the Government uniting all the railways under one general management, to form either a separate branch of the public service, or to be administered by an independent commission or directory. According to the returns for the year 1865 we had at the end of that year a total length of lines amounting to 13,289 miles, returning a net amount above their working expenses of £18,602,582. The total capital returns of the railways up to that date showed that £443,572,250, exclusive of the capital returns for the lines not then open, had been expended in making and working these lines. This being the aggregate amount of railway capital, including ordinary and preference stock, debenture stock and debenture loans, the returns of that year were sufficient to pay a dividend of 4½ per cent. on the total outlay of the kingdom. This aggregate return would be much increased if the railways were all united in interest, and managed, as they ought to be, so that each should facilitate the operations of the rest.

The development of additional traffic by thus consulting the interests of the public would, in itself, add largely to the revenue, and there would be no expense incurred by the ruinous competitions which at times stimulate an unhealthy traffic, to stagnate as soon as the existing cause is removed, and which proves of no permanent benefit either to the shareholders or the public.

There would be further important savings in the payments made to the numerous boards of directors, and to the clearing houses, which would be no longer required if all the lines were amalgamated; legal and parliamentary expenses would also be saved. It may be mentioned here that these latter expenses in connection with railway companies during the six years 1861-66 amounted to more than £17,000 a month.

The Government in this country has maintained the postal establishment, and no one has ever questioned

the fitness of their doing so. The forwarding and delivery of letters was not long left in private hands, and were it so, the country in general would in truth be badly served. The Post-office has also commenced what may be termed a parcels delivery, by means of the book and sample post, a great convenience to the public and a source of profit to the nation; the transmission of money through the post, which has also been undertaken by the office, more than pays its expenses, and is a real boon to such of the public as do not keep banking accounts. The question has lately been started of the Government taking up the telegraph lines, which it will no doubt do sooner or later. All these schemes are but partial recognitions of the one great principle, that in matters so vitally interwoven with the well-being of the community as the forwarding of intelligence, and even of parcels, it is advantageous that the Government should not leave the carrying trade of the country to the mercy of private speculators, but should maintain a well-organised and comprehensive system for the general convenience of the public who pay for it.

The present position of the original shareholders being, as I have shown by the foregoing statement of facts, most unsatisfactory, taken in the aggregate, I propose now to point out how, according to a new system of fares, they may retrieve some part of their losses. If the returns I estimate can be realised (and I believe they will be considerably exceeded) there will be a surplus in hand of about £20,443,382 per annum over the present passenger receipts. A portion of this surplus should of course be reserved as a fund for the future extension of the railway system, say £2,000,000; this would be sufficient to open about one hundred miles of new railway annually, and as there must some day be a stop to the formation of new lines, it is probable that after twenty years no more would be needed, or at least there would be no need to take this into account, because by that time the receipts would have increased sufficiently to defray the costs of such additions.

My proposal is, that Government should avail itself of the power it possesses, and unite the whole of the railways under one general management, as before stated, available for the whole population; a passenger being enabled to travel one journey of any distance in one given direction at a sum little more than nominal. As an illustration of the working and the results of such a scheme, I must take a supposititious case, of course, as it is quite impossible to foresee to what extent such a facility of travelling would increase the numbers of travellers, and it must be borne in mind that it need not be the actual number of individuals who would travel that might be increased (though their number would no doubt be considerable), but that the present travellers would avail themselves of the facilities offered them very much more frequently than at present; and in order to make such estimate, I suppose that the numbers at present travelling would be increased sixfold if they could travel one journey of any distance in one direction for the sum of threepence, which is the minimum sum I have based my calculations upon. Existing fares under the proposed minimum prices may remain as at present; they are comparatively few, and would not affect the calculations.

From the general summary, I find that during the year ending 1865, passenger trains to the number of 3,448,509 ran over 71,206,818 miles, carried 251,959,862 passengers, and produced £14,724,802; this gives an average of nearly 21 miles and 73 passengers for each train, that is about  $3\frac{1}{2}$  passengers for each mile, the average fare paid by each passenger being 1s. 2d.\*

Six times the number of passengers could be carried for a very small (if any) additional expense, and if an universal fare of threepence was charged for any distance for each person, at a very moderate computation six times the present number would travel, and would produce £18,896,989, being £4,172,187 in excess of the present receipts.

The above calculation is made supposing that each person pays only a threepenny fare; but as it will be necessary to divide the passengers into different classes, a much larger receipt may be reckoned upon; for this purpose I would divide the traffic first in half, supposing that half the passengers would travel by single fares (that is to say, would pay for each journey at the time), and these I would subdivide into three classes as follows—at one shilling for first-class, sixpence for second-class, threepence for third-class:

Thus 2)251,959,862 total No. of passengers for 1865

125,979,931, half of ditto

6 times for contemplated increase

7)755,879,586

s.

‡ 1st class 107,982,798 at 1s., 107,982,798

‡ 2nd class 215,965,596 at 6d., 107,982,798

‡ 3rd class 431,931,192 at 3d., 107,982,798

20)323,948,394

£ 16,197,419

The other half I consider would take yearly tickets, which would be issued for first and second-class passengers at £25 and £15 each respectively, giving the holders the privilege of travelling any distance in any direction, in carriages provided expressly for their use; this would give half the number of passengers multiplied by six as before, 755,879,586, divided by 365, to ascertain how many travel per day, say 2,070,903, divided again by 2, supposing that each person takes two journeys a day, which gives 1,035,451; of this number I calculate that 350,000 would take first-class, and 685,451 second-class tickets.

The one, at £25 per ticket, would give 8,750,000

The other, at £15 per ticket, would give 10,281,765

19,031,765

We have from this the following results:—

The single tickets producing.....£16,197,419

The yearly " " ..... 19,031,765

Contemplated receipts..... 35,229,184

Present " ..... 14,785,802

Increase per annum .....£20,443,382

Tickets might be issued for the three classes of single fares—worth 1s., 6d., and 3d.—in a similar manner to the other Government stamps, and a double fare charged to any passengers not provided with a ticket, just as an unstamped letter is charged double for the trouble of collecting the money; and by the adoption of such tickets all accounts would necessarily be much simplified, and the consequent saving in clerks' salaries would more than defray any additional cost there might be in carrying the increased number of passengers.

In cases where local season or yearly tickets are now issued at prices below the £25 and £15 for first and

\* The average fares paid on some of the principal lines are as follows:—

	s.	d.
Great Eastern .....	1	2 +
Great Northern .....	2	1½
Great Western .....	1	10½ —
Lancashire and Yorkshire .....	0	9½ +

London and South Western .....	1	9½ +
London, Brighton and South Coast .....	1	1 —
London, Chatham and Dover .....	0	9 +
Midland .....	1	5 +
North Eastern .....	1	4 +
North Western .....	1	11 +
South Eastern .....	1	0½ +

second class, it will of course be well to retain them; but as they will only confer the privilege of travelling on one line within certain limits their number is not likely to be great. The proposed new yearly tickets might, to suit the public convenience, be issued half-yearly, or even quarterly, at a small increased rate; and it must be remembered that the sale of these tickets would produce a large sum of money at the commencement of the year, and supposing £10,000,000 to be paid in January for such tickets, and the remainder at intervals of three months, the interest for one year, say £500,000, would be an item of some magnitude, while the amount in hand would be an important acquisition for working expenses, &c.

Another item which would increase the returns is that of excess luggage, &c., which produces about one million and a quarter annually. I propose that all luggage placed in the van should be paid for, and from this source, with the increased number of passengers, I estimate an annual revenue of about four millions.

With respect to goods traffic, I have not thought fit to enter into any calculations. Doubtless it would increase, but I do not think it at all likely to increase in the same proportion as the passenger traffic. A bale of goods, an ox or a sheep will perform but one or two railway journeys, but a passenger will travel day after day. An increased goods traffic, moreover, though producing increased profits, necessitates some considerable increase of expenses in the employment of porters, storage-room, and other charges; while the passengers simply require to be carried by the trains from station to station.

For the Government to take up the railways no money would be needed; each shareholder would receive in return for his shares Government railway stock, bearing interest at  $4\frac{1}{2}$  per cent. guaranteed by the State. The amount of these bonds to be given in exchange for the shares should be fixed by a competent tribunal, who should base their calculations on the average price of the shares for the past seven years, so as to arrive at a correct market value; the new stock would be proportionally equal in value to any other Government stock, and the railway proprietors would receive in return for their fluctuating shares securities whose value would vary no more than that of other Government stocks; there are many railways in which the shares have become utterly valueless, yet no doubt the holders of these worthless shares would think themselves hardly dealt with if they had to give them up for nothing. It would be as well in such cases, where there appeared an ultimate probability that these shares might produce a return, to issue to such holders, deferred bonds, to bear interest in the event of the profits from the railways exceeding a certain amount.

As the present returns of the railways, up to the end of 1865, show that a profit of  $4\frac{1}{2}$  per cent. can be obtained on the aggregate capital employed, the Government would be in a position to guarantee that rate of interest, dividing the stock of the different railways in such proportions as would fairly represent their several values.

The holders of deferred bonds should be entitled to interest when the profit, after allowing a sufficient sum for the further development of the system, enabled the State to pay them 1, 2, 3, or even 5 per cent. It might also be arranged that the ordinary railway stock should receive 5 per cent. after the profits of the system permitted it. But after paying this, which might be fixed as the maximum rate of interest, the surplus profits should be applied to the further improvement of the system, in the matters of comfort, and extension of the facilities of communication. Any further surplus would, of course, like the profits of the General Post-office, be placed in the national purse, and be applied to the reduction of taxation.

There will, no doubt, be many readers of this paper who will at once say that the idea of carrying a pas-

senger from London to Edinburgh for threepence is preposterous, but we must remember that it was not until Sir Rowland Hill had shown its feasibility that any one thought it reasonable to take a letter from London to Edinburgh for the same charge as from London to Richmond. It may be said that the analogy does not exist, that the half ounce of a letter is nothing, but that a passenger is really heavy and makes some difference in the cost of running a train. In reply, I say that the delivery of a letter is the most expensive part of its cost to the Post-office, whereas a passenger takes himself away; that the average of trains run, could each carry six times as many passengers as are now conveyed by them, and though the expense might be slightly increased, the increase could be but extremely small, while the receipts, as I show, would be enormously augmented. Any increase of expense would also be further much more than met by doing away with a large number of ticket clerks and others, who would not be required under the new system. The foregoing calculations have been based upon the returns of 1865. Those for 1866 show more favourably for the correctness of my views, and I have no doubt those of 1867 will yet more fully justify my calculations, and the soundness of my plan and arguments.

Without uniting, under one management, all the railways in the kingdom, no considerable saving can be made, and the system cannot be developed as it ought to be, and no board representing different, and, in many cases, conflicting interests, can ever be made to work for the public benefit. The interests are national, and the management, to be effective, must be national also. At the present moment the Government can safely guarantee  $4\frac{1}{2}$  per cent. to the proprietors of railway stock, and this guarantee would at once raise the value, and, consequently, leave a large profit to the Government, therefore all railway proprietors would be benefited by the Government taking up their lines. The public would speedily reap the advantages of a complete and harmonious system of management, with regular and continuous trains running in all directions, and a general diminution of expense; trade would be benefited enormously by the increased facilities of traffic, while the effect upon the money market of at once converting £453,000,000 of sunk capital into readily convertible securities, would be a stimulus of enormous value to the country.

I now lay my scheme before the public, appealing confidently for its favourable consideration, on account of the benefits which all classes would receive from its adoption; in the first place, to railway proprietors, to whom its adoption would at once secure a certain return for their investments, which are, in most cases, now of very doubtful value. To those in authority I appeal, on the grounds of the public duty and high importance of developing to the utmost extent the resources of the country, as well as upon the certainty of increasing the revenue, both directly and indirectly; and to the public in general I appeal, on the above-mentioned grounds, and especially upon those of the enormously increased convenience they would obtain.

#### DISCUSSION.

Mr. Moxon said he thought there was a little discrepancy in the paper, which he should like to have explained. He thought, first of all, a uniform rate of 3d. was advocated, whatever might be the distance, and then afterwards fares of 1s., 6d., and 3d. were spoken of, which made the average higher than 3d.

Mr. HAWES said the paper they had just heard was rather a startling one, but the main element in it was an advocacy of Government interference. The Government were to take the whole management of the railways; and it was assumed that, whereas the average fare per passenger was now about 1s. to 1s. 4d., under that system it would be reduced to 1s., 6d., and 3d., at which there would be a profit, the average being about

10d. The calculations in the paper seemed to him to be quite untrustworthy. The numbers of persons who travelled annually were all mixed up together, including both long and short journeys; whereas, out of the total number, a very great proportion—one-third, if not more—were those who travelled short distances only, and who did not pay anything like a fare of 10d. for their journey. To all those this system would not be beneficial. Then it was assumed that six times as many persons would travel, and that that increased number could be carried at very little or no greater expense than the present number, which was equivalent to saying that they could carry 9 cwt. from London to Edinburgh at the same cost as  $1\frac{1}{2}$  cwt. Then an analogy was drawn between railway travelling and the Post-office, and it was said that Sir Rowland Hill was the first person to discover that the great cost of carrying a letter was not in the mere transit, but in the distribution. But if passengers were carried at the same rate as letters it would come to this:—Letters were carried at 1d. per half ounce, which was equal to nearly £300 per ton; whereas, 3d. per passenger would be so small a tonnage rate as would hardly pay for the porters to carry the passengers' luggage from the booking office to the train, to say nothing of the cost of locomotion. The expense of carrying the passengers was not confined to the locomotive power; there was station accommodation to be provided for the whole length of the line, and other matters, which were altogether ignored. It was said that in carrying a letter from London to Edinburgh the main portion of the expense was caused by the receipt and delivery, and that the same thing applied to passengers; but this was not so; the two things were totally dissimilar. The letter was put into a bag, and not touched until the end of the journey, but the passengers' safety and comfort had to be provided for, and this formed a large element in the expense. If any accident occurred the letters were not damaged, but the amount of compensation which was awarded by juries in the case of a passenger killed or injured was tremendous. They were told that railways did not pay, and therefore the Government should interfere. That involved the great principle that Government management was cheaper than that of private individuals or companies, which he ventured to deny. He did not consider the Post Office was a fair illustration; but even if it were, he had not the smallest doubt but that if a company were established to conduct it with the same able management as was displayed in the case of the London and North Western Railway, the service would be performed at much less cost. He had such faith in the results of private enterprise, and they had such examples before them in the army and navy, the dockyards, and every branch of the civil service, of the cost and bad management of the Government departments, that he thought any one must be very bold who would venture to recommend that a great branch of the industry of the country should be put into Government hands. Government would never keep up with the requirements of the times. It always waited until it was driven on by the wants of the people, while private enterprise took the opposite course and anticipated and almost created those wants. He thought, moreover, it would be very undesirable to put into the hands of Government such an amount of political power as the appointment of two or three hundred thousand persons all over the country. This would be mischievous in a political sense; and he saw no reason to believe that better appointments would be made than at present, when able men were being continually drawn out from the ranks of the workmen to fill the offices of traffic and locomotive superintendents. Many of those who were now taking a distinguished part in the management of some of the great lines had been originally in the workshops, but under Government management, wherever there was a good berth, it was given to some one who had not been brought up in the department, and who, consequently, was often incompetent. He did not

think the proposed change would be beneficial in any point of view. Directors had to study the interests of the public as well as their own, and were constantly considering, particularly on very special occasions, what was the lowest rate at which they could carry passengers, so as to stimulate traffic. Let them make fares as low as they liked, but in the winter months people would not travel beyond a certain extent. Travelling was not only a question of expense, but of time. People did not travel for the sake of riding in a railway carriage, but either for business or pleasure. He denied that it was the duty of the Government to take into their hands the great enterprises of the nation. By so doing they would place Englishmen in the position of the continental nations, looking to the Government to protect them from every danger and provide them with every necessary. They had taken the Post-office, and if they were to take the telegraphs and the railways, he did not know where they were to stop. Why should not they take up the cotton trade, the coal trade, or the iron trade, until the result would be that Englishmen would look to the Government for everything, instead of resting on their own energies? The only instance in which the government was tolerably successfully was the Post-office, and he should dispute much that was said about that. It was allowed that there had been an average return of  $4\frac{1}{2}$  per cent. on our railways, and taking into consideration all the circumstances, that was not so very bad. The competing lines spoken of were not lines running side by side, but were merely competing so far as the termini were concerned, but opened up entirely different districts between them, thus proving of great advantage to the country. If the interest was only  $4\frac{1}{2}$  per cent., yet if capitalists chose to invest their money at that rate, it was their own choice, and they had certainly been of immense service to the country. The security, pleasure, and expedition of travelling were much beyond anything they ever were before, and these capitalists ought not to be deprived of their chance of future profit, though their property might be depressed. He believed the immediate future return of railways would be good, and in the distant future immense; and, therefore, for the Government to come in now, when private persons had taken all the risk, and pay the taxes of the nation out of the profits, would be most unjust, and, he believed, impolitic. He believed both the country at large and individuals would suffer, and the whole spirit and enterprise of the nation would be impaired if such a course were adopted.

Mr. Moxon said he had not had an opportunity of reading the figures quoted in the paper, but he believed the views of the author were based on one or two serious errors. In the first place, with regard to the 3d. fare: on the Derby-day and similar occasions, all the town would want to go to the Derby, and he did not see how the railways could accommodate the numbers. In his opinion Parliament had never done its duty towards railways. In the Manchester and Liverpool Bill there was a provision that not more than ten per cent. should ever be paid, but if ever there was an exception to a general rule it should have been in that case, where a few gentlemen joined together to try a great experiment. He (Mr. Moxon) had, on that occasion, suggested that there was a great opportunity for Parliament, and that they should employ their engineering staff, and at once lay out all the lines in the country, and let them to the lowest bidder, giving them facilities for obtaining the land with a Government title, so that the lines might be made at the smallest possible cost. The Manchester and Liverpool Company, with the aid of their legal assistants, found out a plan of evading the provision as to the rate of dividend by giving bonus-shares reckoned as fully paid-up, and paying dividends on the full nominal amount, and this ought not to be allowed. Sir Robert Peel, after the establishment of railways, thought the best thing for the public was to encourage as much competition as possible,

which he (Mr. Moxon) believed was a great mistake; and from the opening of the Trent Valley extension line he dated a great deal of the mischief which had taken place up to the present time. Speaking of the general system of railway management, he considered the great fault had been an attempt to get very rich very quickly, and the consequence had been rash speculation, with its inevitable results. After condemning the system of proxies, which threw too much power into directors' hands, he said that in many cases the prices paid for land would have frightened any one who was laying out his own money, in one instance £170,000 having been paid for a very small corner of a nobleman's park. The whole system of making what were pronounced by engineers and lawyers to be good lines at any cost, had been altogether injurious, and the consequence was that when one or two companies got into difficulties it seriously affected others which were managed wisely and well. In 1845 there was some difficulty on the part of railways in raising money, and bonds were very low in the market, when suddenly it was said that a large number had been withdrawn, being taken up by the Bank of England. He much regretted that they had never been able to get any accurate returns from the Bank, but he believed that about four millions of bonds were taken at that time by the Bank, the effect of which could not but be very serious. He believed the Bank had been obliged to hold the greater portion ever since, because the railway companies had been unable to redeem them; and when it was said, in 1866, that the Bank came forward and renewed a large number of the bonds of one company, he believed the truth was that they could not do anything else. Nothing would, in his opinion, cure the prevalent evils unless the proxy system were either abolished, or an alteration introduced into it, so that a week or ten days should elapse before the voting took place by means of proxies. By a fortunate accident, two years ago, all the proxies sent out for a meeting of the Great Eastern Company were rendered valueless from some informality in the stamps, and the consequence was that the board had to retire. He considered the use of proxies very bad, both as regarded the public and in the interests of the shareholders. What was now most required was a thoroughly honest and clear system of accounts, under which expenditure fairly chargeable to revenue could no longer be charged to capital.

Mr. S. SIDNEY was afraid they were rather losing sight of the main object which they should keep in view. The reform of the railway system was most important to all, whether shareholders or the public, but they must consider, not only what was desirable, but what was possible. There was not the least doubt that by bringing business habits and principles to bear upon railway matters great improvements might be effected, but they had now brought before them in a new shape the old project for Government interference. It was said that if Government had only begun and laid out a comprehensive system of railways, and prevented competition, very wonderful results would have followed; but at the time of the Liverpool and Manchester line being opened, Government had no engineering staff for the purpose, and the only Government engineer, the late Mr. Walker, gave his opinion directly in opposition to that scheme. Government had been consulted in one or two instances in railway matters, and in every case it had made a grand mistake. The Brighton schemes were referred to Government, the very worst plan was selected, and they saw what was the condition of the Brighton Company now. Again, when Government issued a railway commission, a most able report was prepared, which converted many persons, who thought that if its recommendations were carried out it would be greatly to the benefit of the nation; and it was said amongst other things that competition in the case of the Trent Valley line had done a great deal of harm; but would any one say now that they had not derived great

advantage from the lines condemned by that commission? For instance, the Great Northern was condemned, but it had been of immense benefit in opening up new districts for manufacturing enterprise. He spoke only in the interest of the public. Railway shareholders must take care of themselves. What had been the result where the recommendations of the commission had been carried out? A late duke had received a handsome testimonial for assisting to drive away the railway from the valley of the Thames, and it was a question for some time whether a line should go through Oxford; now there were four, greatly to its advantage, whilst Northampton, which had opposed all railway facilities, now suffered bitterly for want of the accommodation. He knew of only one instance in which a railway had been abandoned, and that was a little line to Newmarket for the accommodation of persons going to the races. With so many good results, why should they turn round to the opposite system, and put the lines into the hands of the Government? It was only lately he saw a statement by a very intelligent French writer, that whilst staying at Perth he saw more trains passing than through any principal town in France. Some of the lines might not pay very good dividends, but they were an enormous convenience to the public. Look at the underground line; that would never have been completed under Government management, but when it was at length constructed by private enterprise its convenience could not be over-estimated. These things had been accomplished with money which would otherwise have gone to South America, Spain, or elsewhere. Englishmen would gamble in something. For many years past they had gambled in railways; they should rejoice to think that their so doing had benefited the nation at large. The paper was certainly of rather a startling nature, and seemed of somewhat the same character as a scheme for supplying trousers by Government at 6d. a pair. No doubt good and cheap garments would be supplied if the taxpayers made up the deficiency. Then, again, it would be a disadvantage for Government to have in its hands the appointment of all the officials, to say nothing of the political power thus conferred. When a man once had a berth under Government, unless he were either an absolute idiot or a defaulter in money matters, he expected to remain there for life, and promotion would not be, as now, by merit solely, but by seniority; and this would pervade the whole system, so that if a porter or station-master neglected his duty, the only redress would be an appeal to Parliament. We should be reduced to the condition of Prussia, where, it had been observed it was a great deal safer to kill a cook than to thrash a station-master. In England we had not the same system of producing first-class public officers as on the Continent, where the cleverest young men were constantly picked out from school and college and put into the public service. Here, he was happy to say, a great many stupid people went into the service of Government, and clever people devoted their talents to private enterprise. Our present railway system was unequalled in the world, and supply had kept pace with the demand; but this was never the case in Government management. The difficulty now was to extend what they had, not to make new lines. When they saw Government managing any commercial undertaking properly, it would be quite soon enough to ask them to undertake the railways. The Post-office was the worst example that could be adduced, for all the most important and difficult part was managed by private enterprise; the railways did the difficult part of the work by contract; and he quite agreed with Mr. Hawes, that if the Post-office were put into the hands of a Company the work would be done better and more cheaply. Every argument in favour of handing over the railways to the Government would tell just as strongly in favour of entrusting them with the clothing of the people, or giving them any other department of industry. While there were railway

directors they were amenable to their constituents and to public opinion, but when once any deficiency or shortcoming was made a Government matter, it must, of course, be defended by Government in Parliament, whether right or wrong. It was the interest of the public to be carried cheaply, but it was not the business of Government to do it.

Mr. N. F. DAVIN said there were two principal propositions before them in the paper, the first of which had been dealt with almost exhaustively, but the second had only been touched upon cursorily. The first was that Government should take the management of railways, and in opposition to that, the benefits arising from competition had been adduced, but it was impossible to have in such a matter as railways free competition. He did not think those who had enquiries to make at the Post-office found the officials so difficult to deal with as had been supposed by one speaker. Government officials were, as a rule, qualified men, and it was not likely that if Government undertook the management of the railways, they would not avail themselves of the services of the best men they could find. The most interesting question, however, was this—Was it possible to introduce—whether by Government or in any other way—an uniform fare for long or short journeys, and that fare as low as 3d. ? This was a most startling proposal certainly, but in endeavouring to follow the figures given in the paper, he thought Mr. Brandon seemed to make out a good case at any rate for consideration. Mr. Hawes' objection was certainly a very cogent one, that a large proportion of the travellers were for short distances, but considering that new things were constantly coming before them, which at first sight were quite as startling, but which soon passed into accomplished facts, he thought the feeling of every scientific man in such a question should be one of thoughtful consideration.

Mr. BORLY had not altered the opinions which he had before expressed on the subject of the Government taking over the railways, but he might say in reference to one point mentioned by Mr. Moxon, that he was present at the last meeting of the Bank of England when it was announced that a much larger amount of railway bonds had been paid off than had been expected, and even more than was necessary, and the whole of the Bank proprietors present were perfectly satisfied with the information given them on this point.

Mr. HUMPHREYS thought some of the strictures of Mr. Hawes were hardly justified under the circumstances; for instance, he had spoken of the expense of carrying passengers as including comfortable accommodation, porters, and so on, and also the cost of occasionally killing a traveller, but all these matters had been included in the calculation, if the figures given by the different railway companies were correct. The cost of stations, of course, formed part of the original outlay of £443,000,000 mentioned. Another point was that a great number of the passengers paid less than the proposed minimum, but deducting even fifty millions on that account—[Mr. Hawes—That would not be nearly enough.]—if even half were deducted, it would still leave a surplus according to the calculations made. Then Mr. Hawes said they could not send people running about long distances however cheap the fares were, but that was just the argument of Mr. Brandon, because there would not be so many expensive journeys to make, and the returns would not be swallowed up. Allusion had also been made to the faults of Government management, but could anything be worse than the management of the London, Chatham, and Dover, and some other lines he could name? As to the idea that if Government took over the railways they would immediately put them in charge of an army of incapables, he thought no government would act so foolishly when they had before them such tried and trusted persons as the gentlemen who managed the London and North-Western Railway. In one sense there was scarcely such a thing as a competing line in the kingdom; certain

lines were in competition to certain points (of which Exeter was an instance) and the result was that to those places only you could travel at very low fares, but at intermediate distances there was no competition. That showed the weakness of the present system, and there could be no doubt that a very large saving indeed would be effected if the whole could be brought under one management. The Chatham and Dover, South Eastern, and Brighton lines were now about to amalgamate in a certain sense, and although all the separate expenses of direction would continue, they reckoned on saving £100,000 a year by the arrangement. As to the political power that would be given to Government, it was no doubt a point for consideration; but he thought they were approaching a time when the political power of a Government would be less than it had been. He thought the great object was to bring the whole system of railways under one management, and if this could be done without placing them in the hands of Government, he should much prefer it, but he did not see how this was possible. The other point was the system of universal fares, and that, he believed, on full and mature consideration, gentlemen would find more feasible than they at first supposed.

Mr. BRANDON said he had unintentionally led some of his friends into error. He was not specially in favour of placing the railways under Government management entirely, but of uniting them all under *one* management; whether as a branch of the Civil Service or under a company, the great object was, that all should be under one management, and without that there never would be proper arrangements. He was no advocate for Government taking up the lines, but he did not see how any other power could effect the requisite amalgamation. They had reserved the right of purchasing all the lines after a certain time, and their powers could then be delegated to any body they thought fit to entrust with them. Even at present, no line could be opened for traffic until it had been inspected by a Government official. He had not referred to the carriage of letters as an analogous case, but as an illustration. It was quite true that there was no means of testing the supposition that six times the number of journeys would be made. He only knew that, for his own part, he should travel six times as much; and he now found that whenever he went a long distance he had no difficulty in procuring a first-class carriage for his own use. He was sorry to find that the discussion had not turned so much upon the real practical points of the system which he proposed as upon the question of Government as against private management.

The CHAIRMAN, in proposing a vote of thanks to Mr. Brandon, said he must concur in the opinion that the views put forward in the paper were somewhat startling, but he could not but think that some of the more important points had been lost sight of in the discussion. The question of Government taking up the railways had been discussed more than once in that room, and the general feeling of every meeting had been against it, for the simple reason, that, although they might have the best officers, they never would have the same amount of progress as under private enterprise. He remembered that on the many occasions when Mr. Brunel was examined on the subject, he always said that there was a continual progress in railway matters, which never could be the case except under a system of private enterprise. Mr. Brandon had referred to the present scramble for traffic amongst the different lines. The object of the working union between the South-Eastern, Chatham and Dover, and Brighton Companies was to avoid this, and to save expense and consult the public convenience by harmonious arrangements. Instead of having three trains starting at about nine o'clock from different termini, they would have one at nine, one at ten, and one at eleven o'clock; and it was calculated that the number of trains could be reduced by one-half, and yet the public would be better served. As to the reduction of fares, he did not think they had

yet any adequate idea of the extent to which it could be carried with the object of increasing traffic, and this view was certainly supported by the analogy of the Post-office. He hoped excursion trains would be done away with, as he believed they were a fruitful source of disaster, and that instead, ordinary trains would be run at very low fares for long distances. Another matter deserving of consideration was the system adopted by the railways of endeavouring to compel passengers to travel in the more expensive class of carriages. There was a story of a nobleman who said he travelled in the third-class because there was not a fourth; that might be a matter of individual taste, but he believed the third-class passengers were the most profitable, and it was certainly upon them that the Metropolitan Railway chiefly depended. They had gone through three phases of railway construction. In the first they were made by private individuals, then the public came in, and then they had what were called contractors' lines. He did not think the general public would ever again embark largely in railway enterprise, but they would come, he believed, to this, that the land through which a railway passed must bear a large proportion of the expense of construction in consideration of the improved value given to it. The right principle would be that the land for a certain distance each side should be taxed for the construction of the railway, for an enormous addition was made to the value of it, to which the owners were in no way entitled, or else this improved value should be taken into account in assessing the amount of compensation. The enormous prices that had been demanded for little bits of land would not be given again, for that was at a time when in many quarters there was a great prejudice against railways, and when towns did all they could to keep railways away from them. In all new matters they had to live and learn, and to go on improving, and whether they looked at the railway or the postal system, they might congratulate themselves on the progress that had been made. He believed that future progress would be made rather by unions of different companies for harmonious working than by Government undertaking the management, although in such a state of things a more complete Government inspection and control in the interest of the public might be necessary, in order to keep the companies up to their duty. Still it was true that for many years to come their own interests would probably be sufficient for that purpose. He was an advocate for private responsibility, not for having Boards numbering a dozen or twenty, but three, five, or seven, and making the individuals responsible. He believed the system of private management and responsibility would be found to be at the root of all successful enterprise. He was sure they would accord to Mr. Brandon a vote of thanks for his interesting paper.

The vote of thanks was then passed and acknowledged.

#### PARIS CENTRAL SCHOOL OF ARTS AND MANUFACTURES.

The Minister of Agriculture, Commerce, and Public Works has just issued the programme of the conditions of admission to this important school, which is open to foreigners as well as natives of France, and on the same conditions. Diplomas of "Engineer of Arts and Manufactures" are granted annually by the minister to those pupils who are recommended by the Council of the School as having passed through all the examinations in a satisfactory manner, and Certificates of Capacity are granted to those who have exhibited sufficient knowledge in the most important departments of instruction. All the pupils are out-of-door scholars, and no uniform, nor any other distinctive mark, is worn by them. The course of study occupies three years, and the fees, including the costs of experiment, are 800 francs (£32) per annum, half the amount being paid on entering, and the

remainder, in two equal instalments, in the months of February and May. The only other conditions are—the deposit of a sum of 35 francs to defray any losses or injuries done by the pupils' negligence, and the purchase of the necessary books and instruments, which may be had at the school, at rates fixed by the director.

In the case of pupils, natives of France, whose families are not in a condition to defray the costs of the school, subventions are granted by the State, under certain conditions, but this, of course, does not apply to foreigners.

All pupils must pass an examination before admission, and these examinations take place twice in the year, namely, in July and October. The programme for admission consists of compositions and oral examination in the following subjects:—French language; arithmetic; elementary geometry; algebra, as far as the general theory of equations exclusively; rectilinear trigonometry; analytical geometry; descriptive geometry; physics; that part of the usual course of the lycées which precedes heat; chemistry; rudiments of metallurgy; natural history; freehand, linear drawing, and tinting. In addition to these, the pupil is examined also in the general subjects, as in other superior schools. Full particulars are to be obtained by application to the secretary of the school. The pupils must have attained the age of seventeen on the first day of the year of application, and must produce testimonials of good conduct, and a certificate of vaccination.

#### Fine Arts.

ART EXHIBITION AT PAU.—The fifth exhibition of the Society of the Friends of Art, of Pau, is now open, and will remain so until the 27th of April. Considering the remoteness of this fashionable resort in the Pyrenees, the number of works exhibited is very large, namely:—361 pictures and drawings, and 21 pieces of sculpture, the latter including a charming statuette, entitled "Concordia," and a bust of Richard Cobden, by a well-known sculptor, M. Mégrét. Twenty-two works have already been purchased by amateurs, but the selections of the Society itself are not yet made; the Museum of Pau and the English Club there are also expected to be purchasers. Altogether this exhibition promises excellent results.

#### Manufactures.

PELLET GUNPOWDER.—The March *Army Circular* contains an appendix in the form of a list of changes in artillery *matériel*, small arms, and other military stores, with instructions relating thereto. These lists of changes will in future be issued monthly with the *Army Circulars*, instead of quarterly as heretofore. The present list contains an order that pellet gunpowder is to be provisionally adopted for all gun charges of 50 lbs. and upwards. The difference between this and ordinary granulated powder is due to the fact that the composition, after having been converted into "meal" in the breaking-down machine, is pressed at once into cylindrical pellets instead of being made into "press cake" and then broken into grains in the granulating machine. The pellets are formed by the meal being placed in a number of holes in a metal plate, into which closely-fitting punches (having projections that form a cavity in the end of each pellet) are forced by hydraulic pressure, adjusted to give the density required. This is the method by which pellets for fuzes and blank ammunition for Snider rifles have long been made in the royal laboratories. When the pellets are dry they are drummed for about half an hour with black lead to glaze them. The following are the particulars of the powder provisionally approved:—Range of density of the pellet, 1·65 to 1·7; diameter of pellet, 0·75 in.; depth, 0·485 in. to 0·495 in.;

diameter of cavity, or indentation in end of pellet, 0.2 in. at top, 0.15 in. at bottom; depth of ditto, 0.25 in.; range in weight of the pellets, 18 gr. to 95 gr., *i.e.*, about 78 to the pound. Pellet powder has been introduced in consequence of its exercising a materially less destructive effect on the guns than the present L. G. R. powder, than which it exerts a smaller maximum pressure. The repeated failures of 13-inch guns, only two of several of these pieces now remaining serviceable, was doubtless due to the destructive quality of this L. G. R. powder when used in very large charges; and, accordingly, the select committee, after instituting experiments with pellet powder, and comparing them with the results obtained in Russia and in America, recommended the introduction of this powder for the guns of the future, in which the charge would exceed 50 lbs. There are no guns larger than the 9-inch of 12 tons actually in the service as yet, though experiments have been made with a 10-inch rifled gun at Shoeburyness, and some 12-inch guns have been constructed during the last year; so that the introduction of the powder will be simultaneous with that of these heavier guns. We may therefore hope that no more large and costly guns will find their way to the list of those which have already yielded to the destructive action of our large grain rifled powder, which is far more powerful than that used by any other nation. Further experiments with pellet and prismatic powder are still in progress, and are likely to extend over a considerable period.

### Commerce.

**SUPPLY OF GRAIN AND FLOUR FOR FRANCE.**—The Minister of Commerce and Agriculture has just presented a report to the Emperor, stating what measures have been taken to facilitate the importation of grain into the country. In the first place, the surcharge on grain and flour imported in foreign vessels was suppressed by decree in November last, and the effect of this measure is shown by the returns of the port of Marseilles; it appears that during the two months preceding the suppression of the surcharge, there were less than 30,000 quarters of grain brought into port by foreign ships, whereas, during the two succeeding months the quantity reached 35,000 quarters. At the instance of the Government, the French railway companies at the same time sent all the trucks and locomotives they could spare into Germany to bring wheat from Hungary into France; the necessity for this has now ceased, and the German railway companies are able to carry all that is presented without assistance. By these means there have been brought into France, by sea and land, between the last harvest and the end of February, about 572,000 tons weight of wheat and flour. The next object to be achieved is the distribution of the supply over the country, in order to produce an equality of price in the various markets, the quotations varying at present from 26 to 30 francs per hectolitre in the east, to 34 and 38 francs in the central and western departments of France. With this view, a diminution has been made in the charges made by the railways for carriage; in the first place, the price was reduced to seven centimes a ton per kilometre, rather more than a penny per mile, on all the lines, except the Western, in whose case the rate was ten centimes, according to a provision to that effect on the price of wheat reaching 20 francs at certain markets. By an arrangement with the railway companies, a further diminution has been made in the tariff of charges, amounting in the case of long distances to about 50 per cent. on the rate just quoted. The present charges are, 6, 5, 4, and 3½ centimes per ton per kilometre for the respective distances of 200, 400, and 800, or more than 800 kilometres. The reduced rates are to be maintained for four months at least. The diminution applies to the carriage of grain, wheaten and rye-flour, rice and buckwheat.

### Colonies.

**BRITISH GUIANA.**—The papers received by the late mail from this colony contain reports of the opening of a new building erected in Georgetown, in connection with the Royal Agricultural and Commercial Society, for the purpose of a local museum. The opportunity was taken to hold an exhibition of indigenous and foreign products of the greatest possible diversity, and it appears to have been a complete success. The following particulars are taken from a local journal, and we think it will be admitted that such efforts are in the highest degree creditable to colonial communities, and especially to such as have to encounter the difficulties of production with an insufficient supply of labour. The Committee of Correspondence, by whom these exhibitions are organised, are, we understand, anxious to direct the attention of those interested in colonial progress to the claims of the newly-established institution to their support in the way of contributions of any suitable specimens:—"The great event of the fortnight has been the local exhibition, which was opened on Thursday, the 13th February, and at the same time the inauguration of the local museum. Shortly after one o'clock his Excellency the Governor arrived, and the proceedings were opened by the Lord Bishop reading prayers suitable to the occasion, and the Honourable E. G. Barr then presented an address to his Excellency, from which the following is an extract—"As an educational establishment I recommend the museum to the favourable support of the Legislature, as it will no doubt prove to be the storehouse from which the youth of the colony will draw much valuable information, which may in the end incite many to increased efforts towards the development of the vast resources of this great country." To this his Excellency made a suitable reply. Mr. Oliver, as president of the Royal Agricultural and Commercial Society, then read an address, of which the following are some of the most interesting portions—"It may not be out of place here to draw a comparison between the export of sugar—the main staple of the colony—in the year 1854, when the first local exhibition was held, and the export in the year 1866, twelve years afterwards. In the year 1854 there were exported 56,580 hogsheads of sugar, and in the year 1866, 91,580 hogsheads. This great and progressive increase, which bids fair in the present year to raise the crop to nearly 100,000 hogsheads, has been produced by importing labourers from distant lands, viz., India and China, who find a profitable field for their labour, and many of whom, in returning to their native country, carry with them the results of their diligence in the wealth they have earned. . . . In the year 1854 the average yield of sugar per acre did not exceed one ton, while at the present time the yield does not fall far short of two tons per acre. It would require no prophetic powers to tell how, in the proper employment of labour, the result would be a doubling of the present production. But while the means of more effective culture have been taken advantage of, the processes of manufacture have, equally if not in a greater ratio, been improved. The common processes of manufacture now exist on comparatively few estates. Improved processes, especially in the use of bisulphite of lime, have become almost universal. Few of the estates of great importance are not possessed of vacuum-pan machinery, thus enabling the proprietors to send into the market an article which meets at once the requirements of the consumer without undergoing the process of the home sugar refiner. And to the energy and enterprise of our landholders this result must be attributed. Who here present would not wish them further and unbounded success? Another point may be mentioned, and it is one which has contributed, although none of us could have predicted it, to the present prosperity of the colony. Alluding again to the period of

the first exhibition in 1854, the colony was then, as it is to a great extent now, supplied with breadstuffs from the United States of North America, and in return the ships carried away four life blood, our metallic currency. But times are changed. We receive our breadstuffs, and in exchange we give our chief staples—sugar and molasses, taken in large quantities, and to us on more favourable terms than can be procured in our mother country. And thus it happens, as would hardly have been believed a few years ago, that we can compete in a free country with the employers of slave labour. Nevertheless, it cannot but be remembered with anxiety that our exports are so few. Shall we continue to depend on one or two staples? We must look before us. Cannot we produce within ourselves one of the principal articles of import—viz., rice? In answer, we would simply ask anyone to view a sample of rice and straw grown in this colony and exhibited by Mr. Lorimer, of Plantation Wales. If such can be produced, why not grow a sufficiency for our own consumption, nay, even for exportation? It is incumbent on our proprietors to see to this. We need also a fresh impulse in the production of such articles as coffee, tobacco, cocoa, and farinas, and it is to be hoped that these may soon form an important addition to our limited exports. And now to revert to a subject of much importance, viz., the facilities which our museum will afford in an educational point of view. On the importance of the study of natural history as a subject of education, it is hardly necessary here to enlarge. It must be well known to most persons present, the high value attached to it by the leading Educationists in England. With these views before us, coinciding as they do with all our best aspirations, can we doubt for a moment that those in this colony who legislate for the well-being of all classes will not fail to render whatever aid is necessary in promoting a scheme so valuable in the training and educating of the rising generation.' In his reply, his Excellency said:—'I entirely concur in the sentiments expressed in the Address with regard to the Exhibition, and I earnestly hope that it may lead to the further development of our trade, and to an increased supply of the staple articles of food of the masses of our population. The Exhibition is so interesting in all its sections and so highly creditable to the exhibitors that I shrink from calling attention to particular objects, but there is one section so important that I cannot refrain from deviating from my original intention. I refer to the live stock section, and chiefly with the view of pointing out the great importance to the colony of raising a much larger supply of stock. It is owing, in a great measure, to the high price of animal food that the cost of living in British Guiana is so excessive. It has been my duty on frequent occasions to direct attention to the great increase of the trade of the colony, owing to the judicious employment of capital, and to more scientific cultivation of the land. The demand for our staple product which has recently sprung up not only in the United States of America, but in the new dominion of Canada, is calculated to produce most important results. It is most gratifying to me to observe that, under a system of free trade, British Guiana is able to compete in the markets of the world with the products of countries where slavery still prevails; and it is most satisfactory to reflect that capitalists need no longer feel that constant apprehension of Imperial legislation which cramped their energies prior to the abolition of slavery and of protection, and which, however inevitable it was, necessarily produced most calamitous results to individuals.' The idea of having a Fine Arts Department was a happy one, as proved by its success, the call for contributions having been answered to an extent which one could not have anticipated. There are paintings and engravings of various descriptions, some of them exceedingly well executed, and there are also articles of vertu; some fine specimens of statuary, carved ivory work, bronzes, old china and valuable

books. Indian curiosities and many other objects attract attention, and there is one part of the gallery devoted to specimens of embroidery, work in wool, worsted, wax, and beads, the greater portion of which are contributed by pupils of the Ursuline Convent School, and speak well for both pupils and instructors. On each side of the entrance are large cases of stuffed birds and animals of various kinds, including the tiger, the tiger-cat, wild-hog, and many others. In the centre of the hall is a large case containing silver and plated articles, jewellery, jugs, masonic emblems, swords, and pistols, &c. There are fine specimens of native gold, and quartz glittering with particles of gold, which have been obtained from the diggings at Cuyuni. Near this case are two tables made of colony wood, inlaid, the workmanship of which would do credit to a first-class tradesman in England. There is some coolie jewellery, which is really attractive, and merits praise as being made in the colony. Of the products of the colony, the list is almost interminable, including starches, gums, barks for medicinal purposes and for dyeing, various other articles available in medicine, oils for external or internal use, such as cocoanut, and laurel oil, cotton fibres, cassareep, pepper, chocolate, cocoa, fruits, preserves, &c. The sugar department attracted much attention, and the jurors had great difficulty in coming to a decision when examining the specimens for the purpose of awarding prizes. It is here open to us to protest, on behalf of the planters of the colony (says the colonial paper from which these particulars are taken), against the unjust legislation of the mother country, which prevents their making first-class sugar for exportation, and excludes them from a fair competition with the refiner in the home markets. Be this as it may, we may sum up our notice of the articles exhibited by saying that any stranger looking at the oils, gums, starches, barks, and other colonial products cannot fail to be impressed with a powerful sense of the vast resources of the colony."

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### Obituary.

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JOHN HERAPATH was born on the 30th May, 1790, at Bristol. His schooling was of a very limited character, and his knowledge seems to have been acquired almost entirely by private and persevering study. At the age of nineteen his great parts and attainments had already attracted the notice of some of those friendly men who love to encourage youthful ardour, and in the year 1809 he was introduced by Mr. William Perry, at his house at Winterbourne, to Mr. Davies Gilbert, a man of fortune, addicted to the study of mathematics and physics, in which he attained some distinction, and a member of Parliament. He received the young student kindly, and his encouragement became a new stimulus to exertion. From this time Herapath pursued his studies with unabated energy, and must have engaged in original researches, for he says that in July, 1811, he was calculating lunar equations, with a view of completing the theory of the moon's motion. In 1815 he married. Soon after this marriage he gave up business and became a teacher of mathematics. Mathematical physics claimed his chief attention, and more particularly the explanation of the phenomena of heat, light, gravity, and cohesion. What was avowedly the great aim of his ambition was the investigation of the laws of the planetary systems, and of cosmical science. His hope was to complete the task of our great countryman Newton, and to enable us to rival the "Mécanique Céleste" of Laplace. In 1818 we trace a contribution of his in the "Annals of Philosophy," Vol. xi., p. 209, on the "Law of Continuity." In 1819, in Vol. xiii., p. 364, there is a paper on "New Demonstrations of the Binomial Theorem." In 1820 he offered a paper to the Royal Society, which, however, was not accepted, and the

matter produced much controversy. At the end of that year Herapath came to the neighbourhood of London, at Cranford, where he again opened a school for mathematics, and for preparing young men for the navy. For several years his public labours alternated between his communications to the "Annals of Philosophy" and "Philosophical Journal," and the controversy with the Royal Society. In 1821 he wrote a paper on the "Theory of Evaporation," published in the "Annals of Philosophy" for April and May. The list of his scientific papers is particularly varied, but much of the material was incorporated in his work known as "Mathematical Physics," and published in 1846. Among his friends was Lord Brougham, who solicited Herapath to correct his mathematical works, and induced him to write for the Useful Knowledge Society, in 1827, a treatise on the "Differential and Integral Calculus." As a journalist his name is known in connection with the "Railway Magazine," called also the "Annals of Science," which contained valuable contributions to physics and mathematics, and their application to the science of the new art of railways. In the latter part of his life he abandoned mathematical teaching, and in 1832 he left Cranford for the metropolis, residing long at Kensington. In the last two years a failure of memory and strength warned him of the end, and, after a short illness, he died on the 24th Feb., 1868, at the age of nearly 78 years. He was elected a member of the Society of Arts in 1865.

### Notes.

EXHIBITION OF POULTRY IN PARIS.—An exhibition of poultry, singing, and other birds, is announced to take place at the gardens of the Société d'Acclimatation in the Bois de Boulogne this month (April), to open on the 19th and close on the 26th. Two former exhibitions of the kind took place at the same gardens in 1862 and 1863 with marked success. It is said that there will be at the same time a show of fancy dogs.

THE WORKS OF THE LATE LÉON FOUCAULT.—The Emperor has decided that the publication and completion of the works of the late celebrated natural philosopher shall be carried on at the cost of the Civil List; a sum equal to £400 per annum is set apart for the purpose, and especially for the completion of the experiments, and the construction of apparatus projected by M. Foucault.

### Correspondence.

MR. FAIRLIE'S PAPER ON RAILWAYS.—SIR,—As one of the oldest members of the Society, perhaps you will allow me to make a few remarks upon one of the most able and practical papers upon the subject which this session has as yet produced, and to express my great regret that I was unable to attend, to have expressed my entire and cordial concurrence in the vote of thanks proposed by the noble Marquis in the chair. It is seldom you meet with men of talent who have the moral courage to express their feelings regardless of the position of the parties against whom they inveigh, be they engineers, directors, managers, or secretaries of railways. Mr. Fairlie has done this, and has given a mass of figures and facts, in the general result of which I most cordially agree. He was corroborated by the silence of those who were present, although there were some of the most influential men, who could have enlightened the meeting by a confirmation or otherwise of the statement of facts put forward by Mr. Fairlie; and I am sure that that gentleman had reason to express "his great disappointment at the way in which the paper had been discussed, as not one of the main points brought forward had been in any way

touched." There can be no question but that the present extravagant system of locomotive power is not only expensive but destructive, and this would be avoided by the adoption of tank engines, the first of which competed with the "Rocket" at the trials upon the Liverpool and Manchester Railway in 1829, and in 1837-38, four others were constructed by myself, as contractors' engines, for the Eastern Counties Railway, when I introduced the outside cylinders, complained of at the time for the alleged unsteady motion thereby increased in the travelling of the engine. These points were discussed at that period by Mr. Edward Woods and myself. I have no hesitation in agreeing with Mr. Fairlie that the dividends from railways would be enormously increased by a reduction of the wear and tear, both of the permanent way and of the locomotive power, together with the better construction of the rolling stock. With regard to the Eastern Counties Railway, of which I was the projector, promoter, and constructor for a period of nearly ten years, the balance-sheets, as issued to the shareholders, show an enormous amount for repair of permanent way, which could be reduced by proper management at least £50,000 per annum. In conclusion, although I do not quite agree with Mr. Fairlie in some of the details, I am certain he has hit the right nail on the head.—I am &c., JOHN BRAITHWAITE, C.E.

14, Abingdon-street, Westminster, March 25, 1868.

MR. FAIRLIE'S PAPER ON RAILWAYS.—SIR,—With reference to Mr. Fairlie's very suggestive paper, although not myself an engineer, I may yet be allowed to remark—1. Granting the possibility that the present enormous weight of our railway engines and carriages may be necessary to give a profound security where the velocity travelled is 30, 40, or 50 miles an hour, the same weight cannot be necessary on our metropolitan lines, where the rate of travelling is only 10 to 15 miles an hour. 2. Could the enormous size and weight of the boilers on our metropolitan railways not be reduced if there were stationary boilers to supply the locomotives with hot instead of cold water as required? 3. Our forefathers believed only in the security of enormously ponderous coaches. We now only believe in the light broughams. Does the fallacy which once existed regarding coaches not still dominate over us regarding railway carriages and engines? Being a holder of stock in a metropolitan railway, I am interested in Mr. Fairlie's economical suggestions.—I am, &c., GEO. WYLD, M.D.

### MEETINGS FOR THE ENSUING WEEK.

- MON.....Royal Inst., 2. General Monthly Meeting.  
Society of Engineers, 7½. Mr. Sydney A. Reade, "The Sewerage Works at Redhill."  
Entomological, 7.  
Victoria Inst., 8.
- TUES ...Civil Engineers, 8. 1. Discussion, "The City Terminus Extension of the Charing-cross Railway." 2. Mr. Wilfrid Airy, "On the Experimental Determination of the Strains on the Ties of a Bow-string Girder."  
Pathological, 8.  
Ethnological, 8. 1. Dr. A. Campbell, "On the Tribes around Darjeeling." 2. Dr. Edw. Mergon, "An Account of some Cases of Arrest of Development." 3. Mr. Francis W. White, "Notes on the Native Inhabitants of Formosa." Society of Arts, 8. Cantor Lecture. Dr. F. Grace Calvert, "On Chloride of Sodium."  
Syro-Egyptian, 7½. Mr. Black, "On the proper Identification of the Mella of St. Paul."
- WED ...Geological, 8. 1. Mr. W. H. Flower, "On the Affinities and probable Habits of the extinct Australian Marsupial, *Thylacoteo carnif-z*, Owen." 2. Mr. E. Hull, "On the Thickness of the Carboniferous Rocks of the Pendle Hills." 3. Mr. E. Hull, "On the relative Ages of the leading Physical Features of the Carboniferous Districts of Lancashire and Yorkshire." 4. Mr. D. Hatch, "On a Salliferous Deposit in St. Domingo." Communicated by Sir R. I. Murchison, Bart.  
Graphic, 8.  
Microscopical, 8.  
Literary Fund, 3.  
Archæological Assoc., 8½.
- SAT .....R. Botanic, 3½.

## PARLIAMENTARY REPORTS.

## SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 21st March, 1868.*

142. West India Islands, &c., Relief—Account.  
Cholera (Constantinople)—Despatch.  
China (Treaty of Tien-tsin)—Memorials.  
Public Petitions—Ninth Report.

*Delivered on 23rd March, 1868.*

55. Bill—Indian Railway Companies.  
58. „ Ecclesiastical Buildings and Glebes (Scotland).  
63. „ Election Petitions and Corrupt Practices at Elections (amended).  
67. „ Tancred's Charity.  
72. „ Compulsory Church Rates Abolition (amended on re-commitment).  
150. Education—Return.  
152. Westminster Hall—Correspondence.  
157. Victoria—Further Correspondence.

*Delivered on 24th March, 1868.*

57. Bill—Titles to Land Consolidation (Scotland).  
60. „ Canongate Annuity Tax.  
71. „ Representation of the People (Ireland).  
73. „ Inclosure.  
101. Court of Session (Scotland)—Returns.  
114. Parishes—Return.  
156. Poor Law Rating—Letter.

*Session 1867.*

575. Colonial Governors and Bishops—Returns.

*Delivered on 25th March, 1868.*

65. Bill—Reformatory Schools (Ireland).  
66. „ Railways (Guards and Passengers Communication).  
64. Military Reserve Funds—Account.  
145. Provincial Colleges (Ireland)—Letter from T. Wyse, Esq.  
153. Meat Supply—Return.  
Schools Inquiry—Report of Commissioners, Vols. 2; 3; 4, Part I.; 5, Part II.; and 6.

## Patents.

*From Commissioners of Patents' Journal, March 27.*

## GRANTS OF PROVISIONAL PROTECTION.

- Bedsteads, &c., metallic—899—W. Hulse and E. Williams.  
Blinds, Venetian—797—R. M. Chevalier.  
Boilers—842—W. Hawthorn.  
Boilers, heating the feed-water for—819—J. Slater.  
Boilers, supplying with water—818—W. A. Lyttle.  
Boot and shoe soles—760—W. R. Lake.  
Boots and shoes, machinery for finishing—879—P. F. Gubault.  
Bottles, feeding—783—T. Atkins.  
Boxes, &c., closing and securing—878—W. A. Lyttle.  
Candles, composite—785—J. Houston.  
Carriages—875—F. Mulliner.  
Cartridges—888—H. A. Bonneville.  
Cigar tubes and pipes combined—809—L. Blumfeld.  
Cinder sifters—854—A. and E. Geary.  
Combing machinery—793—C. E. Brooman.  
Cotton, &c., combing—895—P. J. Livsey.  
Cotton, &c., preparing, &c.—833—S. Brooks.  
Dyeing, &c., brown colouring matters for—821—C. D. Abel.  
Engines—825—J. G. Douglas.  
Engines—882—A. Baumann.  
Engines—883—T. S. L. Beech.  
Engines and boilers—831—H. E. Smith.  
Engines, carding—871—W. Bellhouse, jun., and R. Ashworth.  
Engines, speed regulator, &c. for—1—W. R. Lake.  
Engines, traction—890—D. Greig.  
Engines, &c.—862—W. McNaught.  
Fibrous materials, preparing rovings from waste—850—T. Barnes.  
Fire guards, &c.—791—H. Symons.  
Flour, &c., crushing and sifting—881—E. V. de Forville.  
Fuel—901—W. E. Gedge.  
Game, new, played with balls, cues, &c.—3313—J. H. Brown.  
Gas—747—G. Davies.  
Gas—820—W. B. Kinsey.  
Gas, &c.—891—W. E. Newton.  
Girders or rails, &c.—837—B. Browne.  
Glove boxes, &c., fastenings for—709—F. Neiber.  
Gloves with pockets—811—W. Piddling.  
Harness, &c.—876—J. Clay.  
Horse rakes—897—R. Sims.  
Horses, &c., clipping—866—S. H. Salom and T. Field.  
Iron and steel bars, finishing, &c.—823—J. Jones.  
Iron and steel, puddling—884—H. F. Griffiths and A. Beard, jun.  
Iron and steel, &c., rolling—840—M. T. Shaw and T. H. Head.  
Iron castings—846—W. Thompson.  
Kitchen ranges, &c.—801—F. J. Baynes.  
Knives, &c., cleaning and polishing—822—S. Desborough.  
Lace—858—S. Bates and W. Redgate.  
Lamps, indicator, for cabs, &c.—873—J. P. Knight.  
Liquors, fermented—861—M. Rowand.  
Liquors, measuring spirituous—754—A. V. Newton.  
Looms—180—H. A. Bonneville.

- Looms—787—H. Hargreaves.  
Looms—827—A. Bourdon.  
Lubricators—828—A. V. Newton.  
Magnesia, sulphate of—836—F. Winsor and I. Swindells.  
Manure—855—B. Britten.  
Millstones, dressing—829—J. Wallis.  
Millstones, dressing—880—J. Norman.  
Motive-power—847—H. Fletcher.  
Nails and spikes—877—J. Carter.  
Nuts, machinery for making metallic—803—P. Koch.  
Paper bags—834—E. and J. Broadbent.  
Paper, &c., utilisation of the waste products in making—835—F. Winsor and I. Swindells.  
Pistons—868—W. G. Beattie.  
Railway rolling stock, &c., applying springs to—872—J. B. Haundy-side.  
Railway signals, &c.—852—J. Hodgson.  
Railway wheels, &c., tyres for—805—J. Jeavons.  
Rubber, &c., making articles from hard—815—W. H. Halsey.  
Sewers and drains—482—J. Towle.  
Shafts, axles, &c.—860—G. F. Lyndon.  
Ships' compasses, &c.—843—F. A. Paget.  
Size, &c., machinery for preparing—777—J. Eastwood.  
Slate, &c., ornamenting—896—J. S. Gee.  
Smoke, consuming—718—J. Barker.  
Spindles and shafts, foot-steps for—795—W. Berry.  
Steel, &c.—830—C. Attwood.  
Stereoscopes—799—W. H. Warner and R. C. Murray.  
Telegraph cables, &c.—838—T. Walker.  
Telegraphic apparatus—892—W. E. Newton.  
Traps, stench—817—P. F. Halbard.  
Trusses—885—W. and W. Arthur.  
Tubes, speaking—869—S. Holness.  
Tunnelling machinery—813—P. W. Barlow.  
Vehicle wheels, &c.—894—J. H. Johnson.  
Vessels, ballasting—853—W. E. Newton.  
Vises, &c.—851—A. P. Stephens.  
Water, raising—824—R. Meldrum.  
Water, raising—839—S. Naylor.  
Weapons, side—863—C. S. Möller.  
Window frames, &c., pulleys for—845—F. Ryland.  
Worsted, &c., spinning—864—H. Kershaw.  
Yarn, preparing and conditioning—806—W. Hartley.

## INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

- Cartridges—930—C. E. and J. Green.  
Fuel—970—V. A. Deaubeuf.  
Machines for overcoming resistance—944—H. F. Shaw.

## PATENTS SEALED.

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|-----------------------------|----------------------------------|
| 2744. M. Hamer.             | 2807. A. Bradburn & S. T. Marsh. |
| 2751. W. James and W. Hill. | 2848. T. Blackhurst.             |
| 2752. J. Donald.            | 2904. W. E. Newton.              |
| 2765. R. Fletcher.          | 2924. H. Sharp and F. W. Webb.   |
| 2778. H. Haschke.           | 278. G. Kellogg.                 |
| 2787. G. Townsend.          | 442. W. R. Lake.                 |
| 2794. J. Gutmann.           | 443. W. R. Lake.                 |

*From Commissioners of Patents' Journal, March 31.*

## PATENTS SEALED.

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|-----------------------------------|--|
| 2759. J. G. Jones.                | 2877. J. H. Johnson.                           |
| 2760. G. Allibon and A. Manbré.   | 2901. F. D. Frost.                             |
| 2766. T. E. Clarke.               | 2910. E. Shaw.                                 |
| 2767. W. and S. Smith.            | 2942. A. F. Jaloureau and C. L. Lardy.         |
| 2768. R. H. Taunton.              | 3019. F. M. Smith.                             |
| 2769. F. Parkes.                  | 3042. E. B. Wilson.                            |
| 2773. J. H. Nelson and T. Briggs. | 3091. T. B. Cutts and F. W. Brooksbank.        |
| 2776. F. J. Jeffery.              | 3107. W. E. Newton.                            |
| 2777. C. Mace.                    | 3138. C. L. Hett.                              |
| 2780. W. Spence.                  | 3469. P. G. L. G. Designolle and J. Casthelaz. |
| 2789. A. T. Becks.                | 3501. H. Bessemer.                             |
| 2801. J. Anderson.                | 98. J. G. Tongue.                              |
| 2810. J. Piddington.              | 109. J. G. Tongue.                             |
| 2820. H. Trotter.                 | 150. W. Betts.                                 |
| 2821. T. Ollis.                   | 376. J. Dewar.                                 |
| 2834. R. Reid and E. H. Craigie.  |  |
| 2839. J. James and T. Jones.      |  |
| 2845. W. Warren.                  |  |
| 2870. R. F. Baré and J. Thomson.  |  |

## PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

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|------------------------------|--|
| 823. W. Simons and A. Brown. | 898. W. Savory.                        |
| 884. W. Irlam.               | 900. A. A. Croll.                      |
| 996. W., E., and J. Gray.    | 945. J. R. Wigham.                     |
| 844. H. C. Hurry.            | 863. J. Bruckshaw and W. S. Underhill. |
| 850. J. Dodd.                | 864. F. Le Roy.                        |
| 1001. A. Homfray.            | 882. J. Wright.                        |
| 1043. J. Walker.             | 923. R. A. Brooman.                    |
| 1344. R. and H. Harrild.     | 876. F. A. Mocoquard.                  |
| 856. J. Todd.                |  |

## PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

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|-----------------------------------|--------------------------------|
| 759. T. Davidson and R. Paterson. | 788. W. D. Napier.             |
| 778. W. Sorrell.                  | 795. R. Ridley and J. Rothery. |